Last, as Kuratko pointed out, the LC ω-3 PUFA-enriched foods such as bread, milk, and yogurt also contribute to LC ω-3 PUFA intake, but this 7-item FFQ does not include questions related to the LC ω-3 PUFA-enriched foods.

The Meyer PUFA FFQ validation generated validity co-efficients of 0.9 and 0.7 for DHA and EPA, respectively, when using the methods of triads, 3-d weighed food records, and erythrocyte (or plasma) levels of DHA and EPA [8]. These validity co-efficients are higher than the current 7-item FFQ, which showed correlations of 0.5 when compared with 14-d weighed food records, as well as when compared with erythrocyte (or plasma) levels. This shows that a more detailed PUFA FFQ that bases its LC ω-3 PUFA calculations on analytical data of foods [8] is better than this 7-item FFQ. However, a limitation with the Meyer PUFA FFQ is that it is based on Australian foods. A similar version has recently been validated for New Zealand foods [9], and perhaps it is necessary to develop and validate country-specific PUFA FFQs.

In summary, this 7-item FFQ captures most LC ω-3 PUFA intakes, but it lacks the contribution of red meat and LC ω-3 PUFA-enriched foods. This 7-item FFQ will provide results in terms of mg of DHA and EPA intakes, but this is misleading, as these DHA and EPA values are not accurate given the previous limitations outlined. Perhaps the calculations should provide the answers as a range rather than exact mg values.

Should researchers wish to use a FFQ to determine valid actual values of LC ω-3 PUFA, then they should choose a tailored FFQ designed to capture the intakes of LC ω-3 PUFA, such as the recently validated Meyer PUFA FFQ [8,10]. If the researcher had to choose between the 7-item FFQ presented here or the validated Meyer PUFA FFQ [8,10], the decision should depend on whether the researcher wants valid and actual LC ω-3 PUFA intake data, where the calculations are based on analytical data, or a shorter 7-item FFQ that provides a ballpark figure of LC ω-3 PUFA intakes.

References

[1] Meyer BJ, Kolanu N. Australian children are not consuming enough long chain omega-3 polyunsaturated fatty acids for optimal health. Nutrition 2011;27:1136–40.

[2] Howe PRC, Meyer BJ, Record S, Baghurst K. Dietary intake of long chain omega-3 polyunsaturated fatty acids: contribution of meat sources. Nutrition 2006;22:47–53.

[3] Ponnampalam EN, Mann NJ, Sinclair AJ. Effect of feeding systems of omega-3 fatty acids, conjugated linoleic acid and trans fatty acids in Australian beef cuts: potential impact on human health. Asia Pac J Clin Nutr 2006;15:21–9.

[4] Hino A, Adachi H, Toyomasu K, Yoshida N, Enomoto M, Hiratsuka A, et al. Very long chain N-3 fatty acids intake and carotid atherosclerosis. An epidemiological study evaluated by ultrasonography. Atherosclerosis 2004;176:145–9.

[5] Rissanen T, Voutilainen S, Nyyssonen K, Lakka TA, Salonen JT. Fish-oil derived fatty acids, docosahexaenoic acid and docosapentaenoic acid and the risk of acute coronary events: The Kuopio Ischaemic Heart Disease Risk Factor Study. Circulation 2000;102:2677–9.

[6] Akiba S, Muata T, Kitatani K, Sato T. Involvement of lipoxygenase pathway in docosapentaenoic acid-induced inhibition of platelet aggregation. Biol Pharm Bull 2000;23:1293–7.

[7] Hodgson JM, Burke V, Beilin LJ, Puddey IB. Partial substitution of carbohydrate intake with protein from lean red meat lowers blood pressure in hypertensive people. Am J Clin Nutr 2006;83:780–7.

[8] Swierk M, Williams PG, Wilcox J, Russell K, Meyer BJ. Validation of an Australian electronic food frequency questionnaire to measure polyunsaturated fatty acid intake. Nutrition 2011;27:641–6.

[9] Ingram MA, Stonehouse W, Russell KG, Meyer BJ, Kruger R. Validation of a semi-quantitative food frequency questionnaire to assess PUFA intakes in the New Zealand population. J Nutr 2012;142(11):1968–74.

[10] Meyer BJ, Swierk M, Russell KG. A tailored PUFA food frequency questionnaire assesses long chain omega-3 PUFA better than a generic dietary questionnaire. Nutrition 2013;29:491–6.

Associate Professor Barbara Meyer, B.Sc., (Hons), R.Nutr, Ph.D
University of Wollongong, School of Health Sciences
Northfields Ave, Wollongong
NSW 2522, Australia

http://dx.doi.org/10.1016/j.nut.2013.02.013

Re: Vitamin D: Health panacea or false prophet?

To the Editor:

Michael Glade questions whether the observational evidence that vitamin D reduces the risk for many types of disease may be due to factors other than a lack of exposure to vitamin D [1]. He suggests pausing to reflect on the merits of increasing serum 25 hydroxyvitamin D (25[OH]D) concentrations at the population level until the science is better understood and the potential pitfalls evaluated.

Consider cancer. Much of the strongest evidence that vitamin D from solar ultraviolet-B (UVB) irradiance reduces risk for cancer comes from single-country ecological studies from Australia, China, France, Japan, Spain, and the United States [2], with support from observational and laboratory studies including findings on cancer survival rates [3]. Additionally, an analysis of cancer incidence with respect to occupation in Nordic countries yielded findings similar to those from ecological studies [4]. The scientific way to determine whether solar UVB and vitamin D can be considered causal in reducing risk for cancer is through application of Hill's criteria for causality in a biological system [5]. The primary criteria are strength of association, consistent finding in different populations, biological gradient, plausibility (e.g., mechanisms), experiment (e.g., randomized controlled trial), and analogy. These criteria have been applied to cancer and found generally satisfied for breast and colorectal cancer and, likely, for several other types of cancer [6,7].

There is no question that vitamin D plays a critical role in modulating the immune system both to prevent autoimmune diseases and to enhance fighting infectious diseases including tuberculosis and influenza. Inactive T and B lymphocytes have no vitamin D receptor but when activated they develop a vitamin D receptor and 1,25-dihydroxyvitamin D_3 has been demonstrated to have dramatic influence on T-cell function and decreasing B-cell immunoglobulin synthesis thereby improving immune health. These activities may help explain the association with vitamin D deficiency and increased risk for autoimmune diseases including multiple sclerosis, type 1 diabetes mellitus, and rheumatoid arthritis [8]. Macrophages after ingesting an infectious agent such as tuberculosis immediately begin producing 1,25-dihydroxyvitamin D_3 which in turn is responsible for increasing the expression of cathelicidin, a defensin protein responsible for enhanced innate immunity to flight infectious diseases. This is the likely explanation for why cod liver oil, solariums or being placed at altitudes above 5000 feet,

WBG receives funding from Bio-Tech Pharmacal (Fayetteville, AR) and the Sunlight Research Forum (Veldhoven) and has received funding from the UV Foundation (McLean, VA), the Vitamin D Council (San Luis Obispo, CA), and the Vitamin D Society (Canada). MFH has received funding from the UV Foundation.

all of which enhance the vitamin D status, were found to be effective measures in treating tuberculosis more than 100 years ago. Recent evidence suggests that improvement in vitamin D status reduces risk for upper respiratory tract infections including influenza A infection by more than 40% [9].

The comment about whether a single "biochemical marker can provide meaningful insight into the health status of an individual" overlooks the fact that skin pigmentation varies globally according to solar UV doses; dark enough to reduce the risk for free radical production and DNA damage and folate destruction, yet light enough to permit vitamin D production [10].

As to the higher prevalence of low serum 25(OH)D concentrations among the oldest old, a little known fact is that the prevalence of people with apolipoprotein epsilon4 (ApoE4) decreases with advanced age [11] and ApoE4 is associated with higher serum 25(OH)D concentrations [12].

There is strong evidence that vitamin D reduces the risk for other diseases that are important causes of premature death: cardiovascular disease [13], and type 2 diabetes mellitus [14]. Based on serum 25(OH)D concentration–health outcome relations, it was estimated that if population mean serum 25(OH)D concentrations were raised from 54 nmol/L to 110 nmol/L in developed countries, mortality rates would decrease by 15% to 20% and life expectancy would increase by 2 y [15]. The demonstrated benefits of increasing serum 25(OH)D concentrations greatly outweigh any hypothetical risks in doing so.

References

[1] Glade MJ. Vitamin D: Health panacea or false prophet? Nutrition 2013;29:37–41.
[2] Grant WB. Ecological studies of the UVB–vitamin D–cancer hypothesis; review. Anticancer Res 2012;32:223–36.
[3] Grant WB, Peiris AN. Differences in vitamin D status may account for unexplained disparities in cancer survival rates between African and White Americans. Dermatoendocrinol 2012;4:85–94.
[4] Grant WB. Role of solar UV irradiance and smoking in cancer as inferred from cancer incidence rates by occupation in Nordic countries. Dermatoendocrinol 2012;4:203–11.
[5] Hill AB. The environment and disease: Association or causation? Proc R Soc Med 1965;58:295–300.
[6] Grant WB. How strong is the evidence that solar ultraviolet B and vitamin D reduce the risk of cancer? An examination using Hill's criteria for causality. Dermatoendocrinol 2009;1:17–24.
[7] Mohr SB, Gorham ED, Alcaraz JE, Kane CI, Macera CA, Parsons JE, et al. Does the evidence for an inverse relationship between serum vitamin D status and breast cancer risk satisfy the Hill criteria? Dermatoendocrin 2012;4:152–7.
[8] Holick MF. Vitamin D deficiency. N Engl J Med 2007;357:266–81.
[9] Urashima M, Segawa T, Okazaki M, Kurihara M, Wada Y, Ida H. Randomized trial of vitamin D supplementation to prevent seasonal influenza A in schoolchildren. Am J Clin Nutr 2010;91:1255–60.
[10] Jablonski NG, Chaplin G. Colloquium paper: human skin pigmentation as an adaptation to UV radiation. Proc Natl Acad Sci U S A 2010;107(suppl 2):8962–8.
[11] Kulminski AM, Culminskaya I, Ukraintseva SV, Arbeev KG, Arbeeva L, Wu D, et al. Trade-off in the effects of the apolipoprotein E polymorphism on the ages at onset of CVD and cancer influences human lifespan. Aging Cell 2011;10:533–41.
[12] Huebbe P, Nebel A, Siegert S, Moehring J, Boesch-Saadatmandi C, Most E, et al. APOE ε4 is associated with higher vitamin D levels in targeted replacement mice and humans. FASEB J 2011;25:3262–70.
[13] Wang L, Song Y, Manson JE, Pilz S, März W, Michaëlsson K, et al. Circulating 25-hydroxy-vitamin D and risk of cardiovascular disease: A meta-analysis of prospective studies. Circ Cardiovasc Qual Outcomes 2012;5:819–29.
[14] Afzal S, Bojesen SE, Nordestgaard BG. Low 25-hydroxyvitamin D and risk of type 2 diabetes: A prospective cohort study and meta-analysis. Clin 2013;59:381–91.
[15] Grant WB. An estimate of the global reduction in mortality rates through doubling vitamin D levels. Eur J Clin Nutr 2011;65:1016–26.

William B. Grant, Ph.D
Sunlight, Nutrition, and Health Research Center
San Francisco, CA, USA

Michael F. Holick, M.D., Ph.D
Department of Medicine, Section of Endocrinology
Nutrition, and Diabetes Vitamin D
Skin and Bone Research Laboratory
Boston University Medical Center
Boston, MA, USA

http://dx.doi.org/10.1016/j.nut.2013.01.008

Vitamin D: Let's just ask the right questions. A response to Grant and Holick

To the Editor:

The letter from Drs. Grant and Holick, submitted in response to my review [1], presents a well-reasoned argument supporting the "health panacea" hypothesis. However, they may have missed both the import of the paper as well as an opportunity. The "take-home" message was that epidemiology, as with all research, is able to answer only those questions that are asked. It has not addressed, at least not yet, the issues that are raised in my review about the specific potential downsides or unsuspected pitfalls of universally increasing vitamin D intake from youth into old age. In this context, their argument fails to reconcile the current conflicts between population-based health policies and the individualization of nutritional advice and care.

The potential roles of the Klotho system in altering human longevity deserve better treatment than was afforded the "nonskeletal" benefits of increased vitamin D intake during the past century. In the 21st century, nutrition science must probe beyond the conceptual limitations of the 20th century, no matter how frustrating it may be that those limitations continue to constrain public health policy, in order to advance every individual's opportunity to benefit from nutritional wisdom regarding disease prevention, health maintenance, and the pursuit of human happiness.

Reference

[1] Glade MJ. Vitamin D: Health panacea or false prophet? Nutrition 2013;29:37–41.

Dr. Michael J. Glade, Ph.D
The Nutrition Doctor
Nutrition Institute, PO Box 344
Annville, PA 17003

http://dx.doi.org/10.1016/j.nut.2013.02.017